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A Hand-writing Input Device

Technical field

The present invention relates to a hand-writing input device, more specifically to a character hand-writing input device which has a guiding device and could be used for blind input.

Background technique

As is generally known that the basic and most frequently used characters are the numerals from 0 to 9 and the 26 English letters, these numerals and letters are widely used in the input device of the cell phone, palm PC, etc. There are two technical methods for inputting these characters, one is providing a corresponding key for each character as in the keyboard of a palm PC, and the other is representing a plurality of characters by a single key and selecting different characters through pressing the same key for many times as in the keys of a cell phone.

Blind input is very import in some particular fields, for example, dialing a cell phone when driving. Therefore, various input devices based on touch guidance have been developed. Touch guidance is making use of the convex or concave in shape to form a touch-sensitive surface for the finger (tips). It enables the user to recognize the position of individual input key through the touch of the fingers and thereby enhance blind input.
There are two major types of resistive touch sensitive screen (or touch panel) based on the different structural features of the touch sensitive screen (or touch panel), i.e., resistive digital matrix type touch sensitive screen and resistive analog type touch sensitive screen, for different applications.

Primarily, digital matrix type touch sensitive screen is applied to individual keypad operation. It comprises an individual easy-touching keypad and achieves a specific function, and the touch panel could shift the status of the keypad from switch-off to switch-on. The digital matrix type touch sensitive screen is widely used in display devices for providing public information, industrial equipment control panel and the computer input/output devices.

As an input device for character input, the digital matrix type touch sensitive screen provides corresponding keypads for each letter and numeral, so the number of keypads correspond to the number of the letters and numerals to be inputted, and meanwhile, the input is in a manner of tapping, thus it is difficult to realize blind input and miniaturization.

One of the popular applications of analog type touch sensitive screen is in the hand-writing board of the palm PC and the Mini-notebook. The currently existing hand-writing characters (including letters and numerals) input technology includes an analog touch panel with thousands (or even more) matrix sensor units for sensing the input written strokes, an MPU (processing unit) for encoding, decoding and data transmission as well as a hand-writing recognition software. Hand-writing recognition accuracy has always been the major concern. Besides, the correct order of writing the strokes will directly affect the accuracy of recognition.

Contents of the invention

The object of the present invention is to provide an approach for character input, which could perform character input in the way of hand-writing that suits people's handwriting habit without the support of the huge hand-writing recognition software, and could improve the hand-writing accuracy and realize blind input as well as miniaturize the input device.

According to the first aspect of the present invention, a character input device is provided, said device comprises a hand-writing board and characterized in that said hand-writing board comprises an input surface; a guidance device, provided on said input surface along a predetermined track, and it limits the direction of the hand-writing input stroke during the input to guide the hand-writing to following said predetermined track; a plurality of switch elements provided on particular positions on said predetermined track, when a specific character is inputted by hand-writing, the triggered switch element among said plurality of switch elements will produce the corresponding output, and the combination of the outputs of said plurality of switch elements correspond to the inputted character.

In the first aspect of the present invention, since hand-writing input is made along the predetermined track under the guidance of the guidance device, only few switch elements are needed, so compared with the analog type input device, the present invention greatly simplifies hand-writing recognition, spares huge recognition software and increases hand-writing recognition accuracy; while compared with the digital type input device, the present invention greatly reduces the volume to achieve miniaturization and enables blind input.

A second aspect according to the first aspect of the present invention, said predetermined track is a pattern composed of a first plurality of lengths and a second plurality of lengths. Said first plurality of lengths includes the lengths between each two adjacent points of a first plurality of points Pi sequentially arranged on the closed curve; said second plurality of lengths is formed by the length starting from a point inside of said closed curve and ending at each of the second plurality of points Pj on said closed curve.

A third aspect according to the second aspect of the present invention, wherein said first plurality of lengths includes six lengths, P1P2, P2P3, P3P4, P4P5, P5P6, and P6P1, which are formed by the curve between each two adjacent points of said first plurality of points P1, P2, P3, P4, P5 and P6 sequentially arranged on said closed curve, while said second plurality of lengths includes six lengths, P0P1, P0P3, P0P4, P0P5, P0P6, which are formed by the length starting from a point P0 inside of the closed curve and ending at each of the second plurality of points P1, P2, P3, P4, P5 and P6 on said closed curve (see Fig. 1(c)).

A fourth aspect according to the second aspect of the present invention, said first plurality of lengths includes six lengths P1P2, P2P3, P3P4, P4P5, P5P6, and P6P1, which are formed by the curve between each two adjacent points of said first plurality of points P1, P2, P3, P4, P5 and P6 sequentially arranged on said closed curve, while said second plurality of lengths includes two lengths P0P1 and P0P4, which are formed by the llength starting from a point P0 inside of the closed curve and ending at each of said second plurality of points P1 and P4 on said closed curve

(see Fig. 2(b)).

A fifth aspect according to the second aspect of the present invention, said first plurality of lengths includes six lengths P1P2, P2P3, P3P4, P4P5, P5P6, and P6P1, which are formed by the curves between each two adjacent points of said first plurality of points P1, P2, P3, P4, P5 and P6 sequentially arranged on said closed curve, while said second plurality of lengths includes eight lengths P0P1, P0P2, P0P23, P0P3, P0P4, P0P5, P0P56 and P0P6, which are formed by the length starting from a point P0 inside of the closed curve and ending at each of the second plurality of points P1, P2, P23, P3, P4, P5, P56 and P6 sequentially arranged on said closed curve (see Fig. 3(a)).

A sixth aspect according to the second to fifth aspect of the present invention, wherein the pattern formed by the first plurality of lengths and the second plurality of lengths is substantially center symmetrical.

A seventh aspect according to the second to fifth aspect of the present invention, wherein the pattern formed by the first plurality of lengths and the second plurality of lengths is substantially axis symmetrical.

An eighth aspect according to the second to seventh aspects of the present invention, wherein the closed curve formed by said first plurality of lengths are one from the group including rectangle and rectangle-like, ellipse and ellipse-like, or 8-shape and 8-shape-like.

A ninth aspect according to the second to eighth aspect of the present invention, wherein the special locations of said plurality of switch elements are as follows: arranging a switch element on each of said first plurality of lengths, arranging a switch element on at least one of the two lengths P1P0 and P0P4 in said second plurality of lengths, and arranging a switch element on each of the rest lengths.

According to the tenth aspect of the present invention, said guidance device is a one selected from the group comprising visual guidance device composed of the visual track per se, touching guidance device composed of a concave with said switch element provided therein or /and a convex with said switch element provided thereon.

According to the eleventh aspect of the present invention, the cross-sections of said concave type guidance device and the convex type guidance device are substantially trapezoid or semicircle.

A twelfth aspect according to the first to eleventh aspect of the present invention, wherein said switch element is one selected from the group comprising resistive switch, electro-optical switch, mechanical switch and capacitive switch.

A thirteenth aspect according to the first to twelfth aspects of the present invention, wherein said input surface includes a touch sensitive screen.

A fourteenth aspect according to the thirteenth aspect of the present invention, said resistive switch

is the keypad defined on said touch sensitive screen.

A fifteenth aspect according to the first to fourteenth aspects of the present invention, said input characters include numerals, letters and characters defined by the user.

A sixteenth aspect according to the first to fifteenth aspects of the present invention, the hand-writing input device of the present invention further includes:
a micro-processor unit and a memory, said micro-processor unit obtains codes of characters corresponding to said switch signal combinations from the predetermined inquiry table stored in said memory according to the combination switch signals from said sensitive unit, and then output them.

A seventeenth aspect according to the sixteenth aspect to the present invention, the interfaces adopted by said output include serial interface, parallel communication interface, USB interface, infrared interface and blue-teeth interface.

In the sixteenth and seventeenth aspects, a micro-processor is used to receive the combinations from the outputs of said plurality of switch elements, said micro-processor obtains codes of characters corresponding to the combinations of the outputs of said plurality of switch elements from a memory storing a predetermined inquiry table, and outputs them through an interface.

The hand-writing input device according to the present invention enables the user to input characters by his finger or pen on the digital type matrix touch sensitive screen with the aid of the guidance device arranged along the strokes, and such input method is similar to hand-writing input performed on analog type touch sensitive screen.

In an input combination, the characteristic strokes of the characters could be recognized through judging whether the several keypads (switch elements) are pressed. In the preferred embodiment of the present invention, only 7 or 11 keypads are used to realize hand-writing input of letters, numerals and other characters. Compared with the currently available hand-writing input technique, the present invention reduces the number of keys and the size of the key board, simplifies the recognition software program and provides higher accuracy of recognition.

Description of the figures:

Fig. 1(a) is the frame structure drawing of one embodiment of the present invention.
Fig. 1(b) shows the shapes of the selectable keypad.
Fig. 1(c) is a structure of a stroke-segment of the embodiment.
Fig. 1(d) shows the cross-section of the concave.
Fig. 1(e) shows in detail the structure of the guidance device which could be separated and used as an individual guiding groove plate.
Fig. 1(f) is a stroke definition table of the Framed-star model having 11 keypad units which corresponds to Fig. 1(c).
Fig. 1(g) is a hand-writing input device including a processing circuit.
Fig. 1(h) shows the predefined code table composed of keypads.

Fig. 1(i) is the flow chart of the working process in the present embodiment.
Fig. 2(a) shows the frame structure drawing of another embodiment of the present invention.
Fig. 2(b) is the structure drawing of a stoke segment of the present embodiment.
Fig. 2(c) is the stroke definition table of the present embodiment.
Fig. 2(d) shows the predefined code table composed of keypads.
Fig. 3(a) and Fig. 3(b) are the stroke structure drawings of another embodiment and said embodiment differs from the previous one in that it has one more switch element than the previous one.
Fig. 3(c) corresponds to the stroke definition table of Fig. 3(a).

Description of preferred embodiments

The present invention provides a hand-writing recognition device, which enables the user to easily input on a touch sensitive screen by finger or pen with the aid of the guidance device, meanwhile, the hand-writing input recognition device could correctly recognize the inputs and thereby outputs the corresponding characters or instructions.

In an embodiment of the present invention, said device comprises a hand-writing board which adopts a matrix touch sensitive screen and a certain number of stroke segments are provided thereon and keypads (said keypads are some switch elements) are arranged on these stroke segments, then the user could input by touching or pressing different combinations of keypads (switch elements). The switch element may include resistive touch sensitive screen/switch, optical-electrical switch, mechanical switch, capacitive switch, inductive switch or other sensitive units and their succeeding processing unit. When the user is making inputs, these switch elements could output the status of "on" or "off".

Meanwhile, guidance device (groove guidance device in the present embodiments, or it could also be convex shape guidance device or looking-at type guidance device in other solutions according to the real needs) is arranged on the surface of the touch sensitive screen, said guidance device is provided along the input strokes of the characters.

By means of the guidance device, the user could ensure without seeing that the input made by the finger is in the right stroke. There are shallow recesses in the intersections of the guidance grooves, so that the finger which makes input may stop at this point when sensing it and thereby facilitate blind input.

The keypad array of the touch sensitive screen is connected to an MPU system and the surrounding circuits thereof, and a software program supports the operation of MPU. The MPU scans the keypad array to determines if any keypad is touched (pressed) and stores the scanned "on" status" in the memory as the input.

When a user inputs by finger or pen under the guiding of the guidance groove, a series of keypads will be pressed and these pressed keypads will trigger the corresponding "on" status. The "on" status of these keypads are detected by MPU and stored therein. In the present invention, an inputted series of keypad combination represents a character input and it will be processed by the

software in the MPU.

In the embodiments of the present invention, a time delay method is adopted in judging whether the input process of a character is finished. When a keypad is pressed and released, the clock circuit will start a particular time delay to judge the ending of the character input process. If there is no keypad input in said time delay, said input process is finished. In other solutions, other methods could be adopted to indicate the ending of a character input process, such as pressing a preset particular key.

During the process of inputting a character, the input combination composed of a series of "on" status will be stored and compared with the predefined "on" status combination stored in the code table in the MPU. If any corresponding input combination is found in the code table, the MPU will output a character signal or a instruction signal through RS232 communication serial interface (or parallel communication interface, USB interface, infrared interface, blue-teeth or other communication methods). If said input combination does not match any of the combinations in the code table, said input will be ignored and an instruction will be sent to the loudspeaker at the same time, and the loudspeaker will phonate to indicate the invalid input.

In the present invention, in the process of inputting one character or instruction, the many pressings on the same keypad will only be considered as one valid keypad input.

The hand-writing input device according to the present invention enables the user to make hand-writing input on analog type touch sensitive screen or the user may also input characters by his fingers or pen on the digital matrix touch sensitive screen with the aid of the guidance device which is arranged along the strokes. In an input combination, the characteristic strokes of the character could be recognized by judging whether the keypads are pressed. Compared with the currently available hand-writing input technique, the present invention reduces the number of the keys and the size of the key board, simplifies the recognition software program and provides higher accuracy of recognition.

Fig. 1(a) is a frame structure drawing of an embodiment of the present invention, including a Framed-star type hand-writing board 2, a matrix type touch sensitive screen 1, a glass or polymer base 4 and a touch surface 3. Said matrix type touch sensitive screen includes 11 keypads and these keypads form an array including keypad 1a, keypad 2a, keypad 3a, keypad 4a, keypad 5a, keypad 6a, keypad 7a, keypad 8a, keypad 9a, keypad 10a and keypad 11a. In the present embodiment, the size of the touch sensitive screen is 35mm in width and 45mm in length.

Fig. 1(b) shows the shapes of the selectable keypad, which include a disc 5 having a diameter of 3-6mm, a rounded-rectangle 6 having a width of 3-6mm and a length of 5-8mm, a rectangle 7 or ellipse 8.

Fig. 1(c) is the schematic drawing of the structure of the stroke segments of the Frame-star model, wherein the broken lines indicate the pattern formed by the input tracks, the hatching part indicates the layout of the guidance device and the black dots represent the keypads, i.e., switch elements; the lead-out wire from each switch element represents the output wire of the switch

element. Since the specific method of implementing said switch element and the method of powering it are generally known to those skilled in the art, they will not be elaborated herein. Said solution includes 11 stroke segments, i.e., PiP2, P2P3, P3P4, P4P5, P5P6, P6P1 and P0P2, P0P3, P0P5, P0P6 and P1P0P4, with each stroke segment provided with a switch element (keypad). In the present embodiment, the stroke segment is 4-6mm in width. In order to be shown clearly, these stroke segments are divided into independent stroke segments. Each stroke segment is provided with a keypad, and the ten numerals, 26 English letters and other characters or control instructions could be represented by different input combinations formed by these 11 stroke segments or by the output combination of the switch element. Outputs from a plurality of switch elements could be connected together to an MPU to be processed, and this will be described later; or/and they could be connected to other devices such as a PC or display device directly or through proper interface.

In this description, we call the length between two points such as P1P2 as a length, and one stroke segment may be a length or it may also be composed of two or more lengths, for example, the above-mentioned stroke segment P1P0P4 is composed by two lengths P1P0 and P0P4.

As in Fig. 1(d), the above-mentioned stroke segment is surrounded by seven projections with the height of 0.5-1.5mm, i.e., the six triangular projections as shown in Fig. 1(a): 1c, 2c, 3c, 4c, 5c and 6c and an edge projection 7c. These projections adhere to the surface of the touch sensitive screen. The projections of the touch sensitive screen surface form a slope 10 from the upper surface 9 to the lower surface 11, so that a concave shallow recess is formed, thus the user could write along the correct strokes when making hand-writing input according to the feeling of the finger.

Please refer to Fig. 1(e). The guidance groove could also be separated as an independent guidance groove plate. Fig. 1(e) shows in detail the structure of the guidance groove plate. The guidance groove plate 12 covers the surface 3 of the touch sensitive screen 1, and the structure and size of its projection are the same as those of the Framed-star type guidance groove hand-writing plate as shown in Fig. 1. Eleven groove holes 1e, 2e, 3e, 4e, 5e, 6e, 7e, 8e, 9e, 10e and 11e are distributed on the bottom of the guidance groove plate and are corresponding to the keypad array on the touch sensitive screen. In the present design, the groove hole is a circle and the diameter thereof is longer than that of the keypad by about 1.0-1.5mm. In the structure of the guidance groove plate, the thickness of the bottom of the plate is about 0.2mm and the height of the projection is about 0.5-1.5mm.

Fig. 1(f) is a keypad combination definition table of the Framed-star model having 11 keypad units, which corresponds to Fig. 1(c), and it represents the corresponding numerals and letters. When the user input a character by finger or pen on the touch sensitive screen, for example, numeral 8, the keypads of the eight stroke segments representing "8", i.e., 1a, 2a, 5a, 6a, 7a, 10a and 11a, will be pressed. Besides, the pressed keypads will sequentially trigger the "on" status of the corresponding keypads. In the solution of the present embodiment, different keypad serial combinations will represent different characters.

In fact, in Fig. 1(c), each of lengths P1P0 and P0P4 could be defined as a stroke segment without making any other changes, that is, arranging a switch element on each of P1P0 and P0P4. On the basis of such a structure, those skilled in the art could easily design a definition table that is the

same as or different from the definition table shown in Fig. 1(f).

In the present invention, the definition of the keypad combination represents the combination of the keypads but not the arranging thereof, for example, change the order of pressing the keypad will not change the keypad combination per se, and the numeral 1 could either be keypads 5b and 10b or keypads 10b and 5b.

Fig. 1(g) is a hand-writing device comprising a processing circuit, which includes MPU and memory, and the working process thereof is as follows:

The MPU uninterruptedly scan the keypad array to detect whether any keypad is pressed. The "on" status and "off" status indicate respectively that the keypad is pressed or not pressed. The "on" status will be stored in the memory and will be processed after the input of the character is finished. An input combination is a series of keypad input combinations in an input process and the input process is divided by predetermined time intervals. The time intervals are predetermined in the clock circuit for separating one input combination from the next input combination. In the present embodiment, the time interval is pre-set to be 300ms. The keypad inputs made in the predetermined time interval will be considered as the same input combination. In the present solution, the many times of pressing on the same keypad will be considered as one valid input. In an input combination, the "on" status of a series of the pressed keypads are stored in the memory.

The keypad combination shown in Fig. 1(h) is the predefined code table and it is stored in the memory. A predefined input combination represents a particular numeral or letter and produce the corresponding output. The input combination will be compared with the predefined combination in the code table. If the input combination matches a predefined combination in the code table, the MPU will output a character signal (or instruction signal), and in the present solution, an ASCII character code is outputted. If no predefined input combination in the code table matches the input combination, the MPU will process said input as invalid input, and in this solution, the MPU will send an instruction to the loudspeaker to indicate that said input combination is an undefined keypad combination.

In the present embodiment, the RS232 serial communication interface is adopted as the output interface.

The reset electrical potential allows a reset operation on the processing system.

Fig. 1(i) is the MPU software flow chart, and said flow chart as shown illustrates the method of the MPU processing the input combination in the present embodiment, said method includes:

1. Applying voltage to the keypad array and the status of the keypad could be learnt by measuring the output voltage of the keypad. The program keeps scanning each keypad so as to detect the "on" status of the pressed keypad.
2. The pressing of the first keypad indicates the start of the input process.
3. The program will store the "on" status of the pressed keypad in the memory and start a time delay program as soon as said keypad is released. The program executes the above-mentioned

operation on each pressed keypad. If pressing on new keypad is detected in the time delay interval, said input process is not finished and will be switched to step 3 to be processed continuously.
4. If no "on" status is detected in a time delay, the scanning will be finished and a series of "on" status will be sequentially stored in the memory, and the MPU will then process the input data.
5. The input combination will be compared with the predefined combination in the code table. If there is matching combinations, the program will output an ASCII character code; if there is no matching combinations, the program will switch to the loudspeaker circuit to indicate that this input is invalid. The program will the memory and end this input.

The structure of a groove guidance hand-writing board having a matrix type touch sensitive screen will be introduced in the following, i.e., the Number-8 model. Except for the construction of the stroke segment, this embodiment is substantially the same as the above illustrated Framed-star model. The specific descriptions of this embodiment are as follows:

The matrix type touch sensitive screen of the Number-8 model as shown in Fig. 2(a) comprises 7 keypads 1f, 2f, 3f, 4f, 5f, 6f and 7f. In the present embodiment, the touch sensitive screen is 30-40mm in width and 40-50 in length.

Fig. 2(b) illustrates the configuration of the stroke segment of the Number-8 model, which is configured by stroke segments of P1P2, P2P3, P3P4, P4P5, P5P6, P6P1 and P1P0P4.

As shown in Fig. 2(a), the guidance groove surrounds the above-mentioned seven stroke segments having a width of 4-6mm, i.e., 1d, 2d, 3d, 4d, 5d, 6d, 7d, which are equivalent to P1P2, P2P3, P3P4, P4P5, P5P6, P6P1 and P1P0P4 in Fig. 2(b), and said seven stroke segments form the shape of the number 8. These stroke segments are separated into independent stroke segments in order to be clearly distinguished, and each stroke segment is arranged in a keypad. The ten numerals and 26 English letters and some other characters or control instructions could be represented by different combinations of said seven stroke segments.

Fig. 2(c) is the definition table of the above-mentioned seven stroke segments corresponding to characters.

In the present embodiment, the track of the guidance groove is formed by a rounded frame having a width of 6mm and a horizontal stoke having the same width placed in the center of the frame. The shallow recessed guidance groove is formed by edge projection 1g, upper projection 2g and lower projection 3g. The inner shape of the edge projection is a rounded-rectangle with its top edge sloping down to the groove bottom. The upper and lower projections are of the shape of a disc with a diameter of 6-8mm and its edge also slopes down from top to bottom. The upper and lower projection could also be of the shape of ellipse and raindrop shape with curves (see Fig. 2(a)).

Fig. 2 (d) is the predefined keypad code table for representing the numerals and letters. Said definition is used for the Number-8 model having seven keypads as shown in Fig. 2(a), i.e., 1f, 2f, 3f, 4f, 5f, 6f and 7f. For example, the keypad combination formed by keypad 1f, 2f, 3f, 4f, 5f, 6f and 7f represents numeral 8.

Fig. 3(a) shows the stroke structure of a framed divided saltire type hand-writing board, wherein the stroke in the middle is divided into two strokes with each provided with a keypad. Specifically, said stroke structure includes P1P2, P2P3, P3P4, P4P5, P5P6, P6P1 and P0P1, P0P2, P0P23, P0P3, P0P4, P0P5, P0P56, P0P6.

Fig. 3(b) is another embodiment of the present invention, which shows the plane view of the stroke segments of the framed divided saltire type hand-writing board and indicates the arranging manner of the stroke segments and switch element. As shown in this figure, the stroke segment structure drawing includes P1P2, P2P3, P3P4, P4P5, P5P6, P6P1 and P1P0P4, P0P2, P0P23, P0P3, P0P5, P0P56, P0P6 and the keypad is arranged on each stroke segment. What is different from Figs. 3(a) is that in this embodiment, lengths P1P0 and P0P4 are combined into one stroke segment.

Fig. 3(c) is a drawing exemplifying definition of the stroke segments corresponding to the letters or numerals when using the stroke segment structure drawing as shown in Fig. 3(a).

Obviously, on the basis of the principle of the present invention, those skilled in the art could easily contemplate the definition table of the stroke structure corresponding to the letters or numerals as shown in Fig. 3(b).

There could also be other variations. For example, the upper stroke segments and the lower lengths (P3P3, P5P6) in Figs. 3(a) and 3(b) could also be divided into two stroke segments each.

The other working principles are completely the same as those of the above described embodiments.

Those skilled in the art will understand that according to the principle disclosed in the present invention, other numbers of lengths could be adopted, for example, the first plurality of lengths may not necessarily only include six lengths and it could include more or less lengths according to the real needs. Accordingly, the second plurality of lengths could also be adjusted accordingly.

The present invention is described according to the specific embodiments in the above, however, what are described herein are only examples, and the figures described herein could be changed in many ways as long as they do not deviate from the spirit of the present invention.

For example, resistive touch sensitive screen is used in the embodiment, and the keypad is an area appointed on the touch sensitive screen, however, those skilled in the art will contemplated that these keypads (maybe also some appropriate circuits) function as a switch, so any appropriate switches could replace these resistive type switches. For example, the present invention can also be realized if the touch sensitive screen is not used but the mechanical switches, optical-electrical switches (as used in optical-electrical mouse) or capacitive switches are provided on an input board according to the concept disclosed in the present invention, or the present invention can also be realized by using magnetic switches if magnetic pen is adopted in input.

In addition, all the switch elements in the embodiments of the present invention are substantially

provided in the middle of the stroke segment, while this is not a must according to the principle of the present invention, and it will be all right if the switch elements are simply arranged on the stroke segments. Moreover, a plurality of switches could be provided on a stroke segment and under such circumstance, an AND operation (when the triggered switch elements output low level) or and Or operation (when the triggered switch elements output high level) could be performed on the outputs of said plurality of switches on said one stroke segment to obtain an output. Therefore, in the present description, we call the device formed by one or a plurality of switches as switch element, and obviously, such configuration as a switch element including a plurality of switches could improve sensitivity of input.

Further, the guidance device is described as a concave in the above, but in fact, it could also be arranged as a convex; and in the former case, the switch element is provided in the concave, while in the latter, the switch element is provided on the convex. In addition, the cross-section of the guidance device in the embodiments is exemplified as a trapezoid, while obviously, other shapes will also do, such as a semicircle.

Further, the above-mentioned guidance device enables the user to perform blind input according to the touch. However, under the circumstance of allowing input under the guidance of vision guiding, the guidance device may simply be the visual stroke tracks formed by drawn or printed strokes and the user may perform hand-writing along the stroke track to input.

Further, in the embodiments of the present invention, the shape of the stroke structure pattern is substantially rectangular, and the stroke structure pattern is substantially symmetrical; however, those skilled in the art could easily understand that the stroke structure pattern could be of any appropriate shape and non-symmetrical pattern could also realize the present invention, for example, the point P0 may not necessarily located in the geometrical center of the pattern and the shape of the stroke structure pattern could be rectangle, ellipse, 8-shape, parallelogram, pear-shape or polygon, etc.

Further, in the present invention, it is obvious that not only letters and numerals could be inputted, but also characters defined by the user could be inputted, such as characters for controlling the capitalization of the letter.

Still further, the processing circuit of the present invention could either be combined with the hand-writing board that comprises input surface, switch element, guidance device, or separated from it, for example, the hand-writing board could be coupled to the PC though appropriate connection and the PC could replace the processing circuit.

All these variations are considered as a part of the claimed invention.

In the preferred embodiments of the present invention, only few keypads (7 or 11 keypads) are used to realize hand-writing input of letters, numerals and other characters. Compared with the currently available hand-writing input technique, the present invention reduces the number of keys and the size of the key board, simplifies the recognition software program and provides higher accuracy of recognition.